

IN THE CLAIMS

The following is a complete listing of the claims. This listing replaces all earlier versions and listings of the claims.

Claim 1 (currently amended): A method of creating an image, the image being formed by rendering at least a plurality of graphical objects to be composited according to a hierarchical structure representing a compositing expression for the image, the hierarchical structure including a plurality of nodes each representing at least one region of an object of the image or an operation for combining sub-expressions of the compositing expression, said method comprising the steps of:

2- determining ~~at least a portion of an~~ opacity information region representation for at least one node of the hierarchical structure, the ~~portion of~~ opacity information simultaneously identifying each region representation being assigned one or more of three predetermined values, each predetermined value distinctly identifying whether a corresponding sub-region of at least one object is an opaque region, a transparent region ~~[[and]]~~ or a partially transparent region of at least one object represented by the node;

determining ~~[[a]]~~ an obscurance region representation for the node based on an analysis of the portion of opacity information region representation associated with the node, ~~the region representation indicating at least one visible region of the object represented by the node~~ of the hierarchical structure, the obscurance region representation being assigned one or more of a plurality of further predetermined values, each further predetermined value distinctly identifying whether a corresponding sub-region of the at least one object is in the image;

partitioning the object into a plurality of regions;

overlaying the obscurance region representation on the partitioned object such that the partitioned object is substantially encompassed within the obscurance region representation;

traversing the overlaid obscurance region representation to identify any of the plurality of regions of the partitioned object which include at least a portion of the visible region; and

creating the image by rendering the identified regions.

Claim 2 (currently amended): The method according to claim 1, said method including the further step of traversing the hierarchical structure to detect the node including the obscurance region representation.

Claim 3 (currently amended): The method according to claim 1, wherein the obscurance region representation is traversed for each of the plurality of regions of the partitioned object.

Claim 4 (previously presented): The method according to claim 1, said method including the further step of producing a map for the plurality of regions, wherein the map at least indicates any region which includes at least a portion of the visible region.

Claim 5 (previously presented): The method according to claim 4, wherein the map includes a flag for each of the regions which includes at least a portion of the visible region.

Claim 6 (previously presented): The method according to claim 4, wherein the

map is produced using run-length encoding.

Claim 7 (previously presented): The method according to claim 4, wherein the map is traversed in a predetermined order to determine the identified regions.

Claim 8 (previously presented): The method according to claim 1, said method including the further step of converting the hierarchical structure into a right leaning hierarchical structure.

Claim 9 (previously presented): The method according to claim 1, wherein the hierarchical structure is a graphic object tree.

Claim 10 (currently amended): The method according to claim 1, wherein the obscurance region representation is a quadtree.

Claim 11 (currently amended): A method of creating an image, the image being formed by rendering at least a plurality of graphical objects to be composited according to a hierarchical structure representing a compositing expression for the image, the hierarchical structure including a plurality of nodes each representing ~~at least one region of~~ an object of the image or an operation for combining sub-expressions of the compositing expression, said method comprising the steps of:

determining ~~at least a portion of~~ an opacity information region representation for at least one node of the hierarchical structure, the ~~portion of~~ opacity ~~information simultaneously identifying each~~ region representation being assigned one or more of

three predetermined values, each predetermined value distinctly identifying whether a corresponding sub-region of at least one object is an opaque region, a transparent region
[[and]] or a partially transparent region of at least one object represented by the node;

determining [[a]] an obscurance region representation for the node of the hierarchical structure based on an analysis of the portion of opacity information region representation associated with the node, ~~the region representing indicating at least one visible region of the object represented by the node~~ of the hierarchical structure, the obscurance region representation being assigned one or more of a plurality of further predetermined values, each further predetermined value distinctly identifying whether a corresponding sub-region of the at least one object is in the image;

B, traversing the hierarchical structure to detect the node including the obscurance region representation;

partitioning the object into a plurality of regions upon detecting the node;

overlaying the obscurance region representation on the partitioned object such that the partitioned object is substantially encompassed within the obscurance region representation;

traversing the overlaid obscurance region representation to identify any of the plurality of regions of the partitioned object which include at least a portion of the visible region; and

creating the image by rendering the identified regions.

Claim 12 (currently amended): The method according to claim 11, wherein the obscurance region representation is traversed for each of the plurality of regions of the partitioned object.

Claim 13 (previously presented): The method according to claim 11, said method including the further step of producing a map for the plurality of regions, wherein the map at least indicates any region which includes at least a portion of visible the region.

Claim 14 (previously presented): The method according to claim 13, wherein the map includes a flag for each of the regions which includes at least a portion of the visible region.

Claim 15 (previously presented): The method according to claim 13, wherein the map is produced using run-length encoding.

Claim 16 (previously presented): The method according to claim 13, wherein the map is traversed in a predetermined order to determine the identified regions.

Claim 17 (previously presented): The method according to claim 11, said method including the further step of converting the hierarchical structure into a right leaning hierarchical structure.

Claim 18 (previously presented): The method according to claim 11, wherein the hierarchical structure is a graphic object tree.

Claim 19 (currently amended): The method according to claim 11, wherein the obscurance region representation is a quadtree.

Claim 20 (currently amended): An apparatus for creating an image, the image being formed by rendering at least a plurality of graphical objects to be composited according to a hierarchical structure representing a compositing expression for the image, the hierarchical structure including a plurality of nodes each representing ~~at least one region of~~ an object of the image or an operation for combining sub-expressions of the compositing expression, said apparatus comprising:

B. opacity information region representation determining means for determining ~~at least a portion of an~~ opacity information region representation for at least one node of the hierarchical structure, the ~~portion of opacity information simultaneously, identifying each region representation being assigned one or more of three predetermined values, each predetermined value distinctly identifying whether a corresponding sub-region of at least one object is an~~ opaque region, a transparent region ~~[[and]] or a partially transparent region of at least one object represented by the node;~~

obscurance region representation determining means for determining ~~[[a]] an~~ obscurance region representation for the node of the hierarchical structure based on an analysis of the ~~portion of opacity information region representation~~ associated with the node, ~~the region representation indicating at least one visible region of the object represented by the node of the hierarchical structure, the obscurance region representation being assigned one or more of a plurality of further predetermined values, each further predetermined value distinctly identifying whether a corresponding sub-region is in the image;~~

partitioning means for partitioning the object into a plurality of regions;

overlaying means for overlaying the obscurance region representation on the partitioned object such that the partitioned object is substantially encompassed within the obscurance region representation;

traversing means for traversing the overlaid ~~structure~~ obscurance region representation to identify any of the plurality of regions of the partitioned object which include at least a portion of the visible region; and

image creating means for creating the image by rendering the identified regions.

21 Claim 21 (currently amended): The apparatus according to claim 20, wherein said traversing means further traverses the hierarchical structure to detect the node including the obscurance region representation.

Claim 22 (currently amended): The apparatus according to claim 20, wherein the obscurance region representation is traversed for each of [[said]] the plurality of regions of the partitioned object.

Claim 23 (previously presented): The apparatus according to claim 20, further comprising map producing means for producing a map for the plurality of regions, wherein the map at least indicates any region which includes at least a portion of the visible region.

Claim 24 (previously presented): The apparatus according to claim 20, wherein the hierarchical structure is a graphic object tree.

Claim 25 (currently amended): The apparatus according to claim 20, wherein the obscurance region representation is a quadtree.

Claim 26 (currently amended): An apparatus for creating an image, the image being formed by rendering at least a plurality of graphical objects to be composited according to a hierarchical structure representing a compositing expression for the image, the hierarchical structure including a plurality of nodes each representing ~~at least one region of~~ an object of the image or an operation for combining sub-expressions of the compositing expression, said apparatus comprising:

B. opacity information determining means for determining ~~at least a portion of an~~ opacity information region representation for at least one node of the hierarchical structure, the ~~portion of opacity information simultaneously identifying each region representation being assigned one or more of three predetermined values, each predetermined value distinctly identifying whether a corresponding sub-region of at least one object is an opaque region, a transparent region [[and]] or a partially transparent region of at least one object represented the node;~~

obscurance region representation determining means for determining ~~[[a]] an~~ obscurance region representation for the node of the hierarchical structure based on an analysis of the ~~portion of opacity information region representation~~ associated with the node, ~~the region representation indicating at least one visible region of an object represented by the node of~~ the hierarchical structure, the obscurance region representation being assigned one or more of a plurality of further predetermined values, each further predetermined value distinctly identifying whether a corresponding sub-region of the at least one object is in the image;

first traversing means for traversing the hierarchical structure to detect the node including the obscurance region representation;

partitioning means for partitioning the object into a plurality of regions upon detecting the node;

overlaying means for overlaying the obscurance region representation on the partitioned object such that the partitioned object is substantially encompassed within the obscurance region representation;

second traversing means for traversing the overlaid obscurance region representation to identify any of the plurality of regions of the partitioned object which included at least a portion of the visible region; and

image creating means for creating the image by rendering the identified regions.

Claim 27 (currently amended): The apparatus according to claim 26, wherein the obscurance region representation is traversed for each of the plurality of regions of the partitioned object.

Claim 28 (previously presented): The apparatus according to claim 26, further including map producing means for producing a map for the plurality of regions, wherein the map at least indicates any region which includes at least a portion of the visible region.

Claim 29 (previously presented): The apparatus according to claim 26, wherein the hierarchical structure is a graphic object tree.

Claim 30 (currently amended): The apparatus according to claim 26, wherein the obscurance region representation is a quadtree.

Claim 31 (currently amended): A computer program for a computer comprising software code portions for performing a method of creating an image, the image being formed by rendering at least a plurality of graphical objects to be composited according to a hierarchical structure representing a compositing expression for the image, the hierarchical structure including a plurality of nodes each representing ~~at least one region of~~ an object of the image or an operation for combining sub-expressions of the compositing expression, said program comprising:

B₁ code for determining ~~at least a portion of~~ an opacity information region representation for at least one node of the hierarchical structure, the ~~portion of~~ opacity information ~~simultaneously identifying each~~ region representation being assigned one or more of three predetermined values, each predetermined value distinctly identifying whether a corresponding sub-region of at least one object is an opaque region, a transparent region ~~[[and]] or a partially transparent region of at least one object represented by the node;~~

code for determining ~~[[a]]~~ an obscurance region representation for the node based on an analysis of the ~~portion of opacity information region representation~~ associated with the node, ~~the region representation indicating at least one visible region of the object represented by the node~~ of the hierarchical structure, the obscurance region representation being assigned one or more of a plurality of further predetermined values, each further predetermined value distinctly identifying whether a corresponding sub-region is in the image;

code for partitioning the object into a plurality of regions;

code for overlaying the obscurance region representation on the partitioned object such that the partitioned object is substantially encompassed within the obscurance region representation;

code for traversing the overlaid obscurance region representation to identify any of the plurality of regions of the partitioned object which include at least a portion of the visible region; and

code for creating the image by rendering the identified regions.

Claim 32 (currently amended): A computer readable medium storing a computer program, wherein said computer program comprises software code portions for performing a method of creating an image, the image being formed by rendering at least a plurality of graphical objects to be composited according to a hierarchical structure representing a compositing expression for the image, the hierarchical structure including a plurality of nodes each representing ~~at least one region of~~ an object of the image or an operation for combining sub-expressions of the compositing expression, said program comprising:

code for determining ~~at least a portion of~~ an opacity information region representation for at least one node of the hierarchical structure, the ~~portion of~~ opacity information ~~simultaneously identifying each region representation being assigned one or more of three predetermined values, each predetermined value distinctly identifying whether a corresponding sub-region of at least one object is an~~ opaque region, a transparent region ~~[[and]] or a partially transparent region of at least one object represented by the node;~~

code for determining ~~[[a]]~~ an obscurance region representation for the node of the hierarchical structure based on an analysis of the ~~portion of~~ opacity information region representation associated with the node, ~~the region representation indicating at least one~~

~~visible region of the object represented by the node of the hierarchical structure, the obscurity~~
~~region representation being assigned one or more of a plurality of further predetermined values,~~
~~each further predetermined value distinctly identifying whether a corresponding sub-region of the~~
~~at least one object is in the image;~~

code for traversing the hierarchical structure to detect the node
including the obscurity region representation;

code for partitioning the object into a plurality of regions upon
detecting the node;

code for overlaying the obscurity region representation on the
partitioned object such that the partitioned object is substantially encompassed within the
obscurity region representation;

code for traversing the overlaid obscurity region representation to
identify any of the plurality of regions of the partitioned object which include at least a portion of
the visible region; and

code for creating the image by rendering the identified regions.

Claim 33 (currently amended): A method for optimizing an expression tree,
the expression tree representing a compositing expression for compositing an image and
comprising a plurality of nodes, each node of the expression tree representing ~~at least one region~~
~~of an object of the image or an operation for combining sub-expressions of the compositing~~
~~expression, said method comprising the steps of:~~

determining ~~at least a portion of an~~ opacity information region
representation for at least one node of the expression tree, the ~~portion of opacity information~~
~~simultaneously identifying each region representation being assigned one or more of three~~

predetermined values, each predetermined value distinctly identifying whether a corresponding sub-region is an opaque region, a transparent region [[and]] or a partially transparent region represented by the node; and

optimizing the expression tree by determining an obscurity information region representation for at least the node of the expression tree ~~using the portion~~ based on an analysis of the opacity information region representation associated with the node; wherein the obscurity information indicates at least one visible region represented by the node of the expression tree, the obscurity region representation being assigned one or more of a plurality of further predetermined values, each further predetermined value distinctly identifying whether a corresponding sub-region is visible in the image.

B. Claim 34 (currently amended): The method according to claim 33, wherein the opacity information is represented by region representation is a first hierarchical structure.

Claim 35 (currently amended): The method according to claim 33, wherein the obscurity information is represented by region representation is a second hierarchical structure.

Claim 36 (previously presented): The method according to claim 33, said method comprising the further step of identifying nodes representing complex graphical object.

Claim 37 (currently amended): The method according to claim 36, said method comprising the further step of determining an opacity information region representation for each node identified.

Claims 38 and 39 (canceled)

Claim 40 (currently amended): The method according to claim 33, wherein an opacity information region representation of a child node is at least propagated to a parent node associated with the child node.

Claim 41 (canceled)

Claim 42 (currently amended): The method according to claim 33, wherein an obscurance information region representation of a parent node is at least propagated to a child node associated with the parent node.

Claim 43 (previously presented): The method according to claim 34, wherein the first hierarchical structure is dependent on an operation associated with a node for which the first hierarchical structure is constructed.

Claim 44 (previously presented): The method according to claim 35, wherein the second hierarchical structures for a node are constructed by combining any first hierarchical structures associated with the node.

Claim 45 (currently amended): The method according to claim 34, wherein each leaf node of the first hierarchical structure is assigned ~~a value~~ one of the predetermined values depending on an opacity of a region sub-region associated with the leaf node.

Claim 46 (previously presented): The method according to claim 33, said method including the further step of converting the expression tree into a right leaning tree.

Claim 47 (previously presented): The method according to claim 34, wherein each node of the first hierarchical structure comprises a pointer indicating children nodes associated with the node.

Claim 48 (previously presented): The method according to claim 35, wherein the second hierarchical structure is a quadtree.

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Claim 49 (currently amended): The method according to claim 33, wherein the opacity ~~information~~ region representation is ~~represented by a~~ bounding ~~[[boxes]]~~ box.

Claim 50 (currently amended): The method according to claim 33, wherein the obscurance ~~information~~ region representation is ~~represented by a~~ bounding ~~[[boxes]]~~ box.

Claim 51 (currently amended): A method for optimizing an expression tree, the expression tree representing a compositing expression for compositing an image and comprising a plurality of nodes, each node of the expression tree representing ~~at least one region~~ of an object of an operation for combining sub-expressions of the compositing expression, said method comprising the steps of:

determining ~~a first hierarchical structure~~ an opacity quadtree for at least one node of the expression tree, the ~~first hierarchical structure simultaneously identifying each~~ opacity quadtree being assigned one or more of three predetermined values, each predetermined

value distinctly identifying whether a corresponding sub-region is an opaque region, a transparent region [[and]] or a partially transparent region represented by the node; and
optimizing the expression tree by determining ~~a second hierarchical structure~~ an obscurance quadtree for at least the node of the expression tree using the ~~first hierarchical structure, wherein the second hierarchical structure indicates at least one visible region represented by the node~~ opacity quadtree associated with the node of the expression tree, and the obscurance quadtree being assigned one or more of a plurality of further predetermined values, each further predetermined value distinctly identifying whether a corresponding sub-region is visible in the image.

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Claim 52 (currently amended): A method for optimizing an expression tree, the expression tree representing a compositing expression for compositing an image and comprising a plurality of nodes, each node of the expression tree representing ~~at least one region~~ of an object of the image or an operation for combining sub-expressions of the compositing expression, said method comprising the steps of:

identifying at least one node having an associated complex graphical object;

determining opacity information for the node;

determining ~~[[a]]~~ an opacity region representation for the node based on the opacity information associated with the node, the ~~[[first]]~~ opacity region representation being assigned one or more of three predetermined values, each predetermined value distinctly identifying whether a corresponding sub-region of at least one object is an simultaneously identifying each opaque region, a transparent region ~~[[and]]~~ or a partially transparent region ~~of at least one object represented by the node; and~~

optimizing the expression tree by determining a ~~second~~ an obscurance region representation for the node using the ~~[[first]]~~ opacity region representation, the ~~second~~ obscurance region representation being assigned one or more of a plurality of further predetermined values, each further predetermined value distinctly identifying whether a corresponding sub-region is indicating at least one visible region of the object represented by the node in the image.

Claim 53 (canceled)

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Claim 54 (original): The method according to claim 52, wherein each node having an associated complex graphical object is tagged.

Claim 55 (canceled)

Claim 56 (currently amended): The method according to claim 52, wherein the opacity information is propagated down the expression tree.

Claim 57 (currently amended): The method according to claim 52, wherein a ~~first~~ an opacity region representation of a child node is at least propagated to a parent node associated with the child node.

Claim 58 (canceled)

Claim 59 (currently amended): The method according to claim 52, wherein a ~~second~~ an obscurance region representation of a parent node is at least propagated to a child node associated with the parent node.

Claim 60 (currently amended): The method according to claim 52, wherein the ~~[[first]]~~ opacity region representation is dependent on an operation associated with a node for which the ~~[[first]]~~ opacity region representation is determined.

Claim 61 (currently amended): The method according to claim 52, wherein the ~~second~~ obscurance region representation for a node is determined by combining any ~~[[first]]~~ opacity region representations associated with the node.

Claim 62 (currently amended): The method according to claim 52, wherein each leaf node of the ~~[[first]]~~ opacity region representation is assigned a value depending on an opacity of a ~~[[region]]~~ sub-region associated with the leaf node.

Claim 63 (currently amended): The method according to claim 52, wherein each node of the ~~[[first]]~~ opacity region representation comprises a pointer to indicate children nodes associated with the node.

Claim 64 (currently amended): The method according to claim 52, wherein the ~~[[first]]~~ opacity and ~~second~~ obscurance region representations are quadtrees.

Claim 65 (currently amended): An apparatus for optimizing an expression tree, the expression tree representing a compositing expression for compositing an image and comprising a plurality of nodes, each node of the expression tree representing ~~at least one region~~ of an object of the image or an operation for combining sub-expressions of the compositing expression, said apparatus comprising:

B means for determining ~~at least a portion of an~~ opacity information region representation for at least one node of the expression tree, the opacity information ~~simultaneously identifying each region representation being assigned one or more of three~~ predetermined values, each predetermined value distinctly identifying whether a corresponding sub-region represented by the node of the expression tree is an opaque region, a transparent region ~~[[and]]~~ or a partially transparent region ~~represented by the node~~; and

means for optimizing the expression tree by determining an ~~information~~ obscurance region representation for at least the node of the expression tree ~~using the portion~~ based on an analysis of the ~~opacity information region representation~~ associated with the node ~~of the expression tree, the obscurance region representation being assigned one or more of three~~ further predetermined values, each further predetermined value distinctly identifying whether a corresponding sub-region is, ~~wherein the obscurance information indicates at least one visible region represented by the node in the image.~~

Claim 66 (currently amended): The apparatus according to claim 65, wherein the opacity information region representation is ~~represented by~~ a first hierarchical structure.

Claim 67 (currently amended): The apparatus according to claim 65, wherein the obscurance ~~information~~ region representation is ~~represented by~~ a second hierarchical structure.

Claim 68 (previously presented): The apparatus according to claim 65, further comprising means for identifying nodes having an associated complex graphical object.

B₁ Claim 69 (currently amended): The apparatus according to claim 68, further comprising means for determining an opacity ~~information~~ region representation for each node identified.

Claim 70 (previously presented): The apparatus according to claim 67, wherein the second hierarchical structure is a quadtree.

Claim 71 (currently amended): The apparatus according to claim 65, wherein the opacity ~~information~~ region representation is ~~represented by~~ a bounding ~~[[boxes]]~~ box.

Claim 72 (currently amended): The apparatus according to claim 65, wherein the obscurance ~~information~~ region representation is ~~represented by~~ a bounding ~~[[boxes]]~~ box.

Claim 73 (currently amended): An apparatus for optimizing an expression tree, the expression tree representing a compositing expression for compositing an image and comprising a plurality of nodes, each node of the expression tree representing ~~at least one region~~

of an object of the image or an operation for combining sub-expressions of the compositing expression, said apparatus comprising:

means for determining ~~a first hierarchical structure~~ an opacity quadtree for at least one node of the expression tree, the ~~first hierarchical structure simultaneously identifying each~~ opacity quadtree being assigned one or more of three predetermined values, each predetermined value distinctly identifying whether a corresponding sub-region is an opaque region, a transparent region [[and]] or a partially transparent region represented by the node; and

means for optimizing the expression tree by determining ~~a second hierarchical structure~~ an obscurance quadtree for at least the node of the expression tree using the ~~first hierarchical structure, wherein the second hierarchical structure indicates at least one~~ opacity quadtree associated with the node of the expression tree, the obscurance quadtree being assigned one or more of a plurality of further predetermined values, each further predetermined value distinctly identifying whether a corresponding sub-region is visible in the image region represented by the node;

Claim 74 (currently amended): An apparatus for optimizing an expression tree, the expression tree representing a compositing expression for compositing an image and comprising a plurality of nodes, each node of the expression tree representing ~~at least one region~~ of an object of the image or an operation for combining sub-expressions of the compositing expression, said apparatus comprising:

means for identifying at least one node having an associated complex graphical object;

means for determining opacity information for the node;

means for determining ~~a first~~ an opacity region representation for the node based on the opacity information associated with the node, the ~~[[first]]~~ opacity region representation ~~simultaneously identifying~~ being assigned one or more of three predetermined values, each predetermined value distinctly identifying whether a corresponding sub-region of at least one object is an opaque ~~[[regions]]~~ region, a transparent regions and region or a partially transparent region ~~regions of at least one object represented by the node;~~ and

means for optimizing the expression tree by determining ~~a second~~ an obscurance region representation for the node using the ~~[[first]]~~ opacity region representation, the ~~second~~ obscurance region representation ~~indicating at least one~~ being assigned one or more of a plurality of further predetermined values, each further predetermined value distinctly identifying whether a corresponding sub-region is visible ~~region of the object represented by the node in the image.~~

Claim 75 (canceled)

Claim 76 (original): The apparatus according to claim 74, wherein each node having an associated complex graphical object is tagged.

Claim 77 (canceled)

Claim 78 (currently amended): A computer program for a computer comprising software code portions for performing a method for optimizing an expression tree, the expression tree representing a compositing expression for compositing an image and comprising a plurality of nodes, each node of the expression tree representing ~~at least one region~~

of an object of the image or an operation for combining sub-expressions of the compositing expression, said program comprising:

code for determining ~~at least a portion of an~~ opacity information region representation for at least one node of the expression tree, the ~~portion of opacity information simultaneously identifying each region representation being assigned one or more of three~~ predetermined values, each predetermined value distinctly identifying whether a corresponding sub-region is an opaque region, a transparent region [[and]] or a partially transparent region represented by the node; and

code for optimizing the expression tree by determining an obscurance information region representation for at least the node of the expression tree ~~[[using]] based on an analysis of the opacity information, wherein the obscurance information indicates at least one visible region represented by the node~~ region representation associated with the node of the expression tree, the obscurance region representation being assigned one or more of a plurality of further predetermined values, each further predetermined value distinctly identifying whether a corresponding sub-region is visible in the image.

Claim 79 (currently amended): A computer readable medium storing a computer program, wherein said computer program comprises software code portions for performing a method for optimizing an expression tree, the expression tree representing a compositing expression for compositing an image and comprising a plurality of nodes, each node of the expression tree representing ~~at least one region of an object of the image or an operation for combining sub-expressions of the compositing expression~~, said program comprising:

code for determining ~~a first hierarchical structure~~ an opacity quadtree for at least one node of the expression tree, the ~~first hierarchical structure simultaneously~~

~~identifying each opacity quadtree being assigned one or more of three predetermined values, each predetermined value distinctly identifying whether a corresponding sub-region is an opaque region, a transparent region [[and]] or a partially transparent region represented by the node; and~~
~~code for optimizing the expression tree by determining a second hierarchical structure an obscurance quadtree for at least the node of the expression tree using the first hierarchical structure, wherein the second hierarchical structure indicates at least one opacity quadtree associated with the node of the expression tree, the obscurance quadtree being assigned one or more of a plurality of further predetermined values, each further predetermined value distinctly identifying whether a corresponding sub-region is visible region represented by the node in the image.~~

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Claim 80 (currently amended): A method for optimizing an expression tree, the expression tree representing a compositing expression for compositing an image and comprising a plurality of nodes, each node of the expression tree representing ~~at least one region of an object of the image or an operation for combining sub-expressions of the compositing expression~~, said method comprising the steps of:

~~determining a region representation~~ an opacity quadtree for at least one node of the expression tree, each node of the opacity quadtree being assigned one of three predetermined values, each predetermined value distinctly identifying whether a corresponding sub-region is an ~~the region representation simultaneously identifying each opaque region, a transparent region [[and]] or a partially transparent region represented by the node; and~~

~~optimizing the expression tree by determining compositing information for at least the node of the expression tree, the compositing information for a node being determined using the region representation opacity quadtree associated with the node, wherein~~

the compositing information represents at least one visible region to be composited for an object associated with the node.

Claim 81 (previously presented): The method according to claim 80, wherein the compositing information is represented by a first hierarchical structure.

Claim 82 (currently amended): The method according to claim 81, further comprising the step of identifying nodes of the expression tree, for which a first hierarchical structure is required, depending on the ~~region representation~~ opacity quadtree associated with the node.

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Claims 83 and 84 (canceled)

Claim 85 (currently amended): The method according to claim 81, wherein the first hierarchical structure is dependent on the ~~region representation~~ opacity quadtree.

Claim 86 (canceled)

Claim 87 (currently amended): The method according to claim ~~[[83]]~~ 80, wherein a ~~region representation~~ an opacity quadtree of a child node is at least propagated to a parent node associated with the child node.

Claim 88 (currently amended): The method according to claim 87, wherein a ~~region representation~~ an opacity quadtree of the parent node is determined by merging at least two ~~second hierarchical structures~~ further opacity quadtrees.

Claim 89 (currently amended): The method according to claim 87, wherein a ~~region representation~~ an opacity quadtree of the parent node is determined by merging at least one ~~second hierarchical structure~~ opacity quadtree and a bounding box.

Claim 90 (canceled)

B- Claim 91 (currently amended): The method according to claim 81, wherein a ~~first hierarchical structure~~ an obscurance quadtree of a parent node is at least propagated to a child node associated with the parent node.

Claim 92 (canceled)

Claim 93 (currently amended): The method according to claim ~~[[83]]~~ 80, wherein each leaf node of the ~~second hierarchical structure~~ obscurance quadtree is assigned a ~~value~~ one of the predetermined values depending on an opacity of a ~~[[region]]~~ sub-region associated with the leaf node.

Claim 94 (currently amended): The method according to claim ~~[[83]]~~ 80, wherein each node of the ~~second hierarchical structure~~ opacity quadtree comprises a pointer to indicate child nodes associated with the node.

Claim 95 (canceled)

Claim 96 (currently amended): A method for optimizing an expression tree, the expression tree representing a compositing expression for compositing an image and comprising a plurality of nodes, each node of the expression tree representing ~~at least one region~~ of an object of the image or an operation for combining sub-expressions of the compositing expression, said method comprising the steps of:

31 determining ~~at least a portion of an~~ opacity information region representation for at least one node of the expression tree, each node of the portion of opacity information simultaneously identifying each region representation being assigned one of three predetermined values, each predetermined value distinctly identifying whether a corresponding sub-region is an opaque region, [[each]] a transparent region and each or a partially transparent represented by the region node; and

optimizing the expression tree by determining a hierarchical structure for at least one node of the expression tree, wherein the [[first]] hierarchical structure is determined for a node using the opacity information region representation determined for the node, and wherein the hierarchical structure represents at least visible regions, load regions and invisible regions to be composited, for an object associated with the node.

Claim 97 (currently amended): A method for optimizing an expression tree, the expression tree representing a compositing expression for compositing an image and comprising a plurality of nodes, each node of the expression tree representing ~~at least one region~~ of an object of the image or an operation for combining sub-expressions of the compositing expression, said method comprising the steps of:

performing a first traversal of the expression tree to determine ~~at least a portion~~
of an opacity information region representation for at least one node of the expression tree, the
~~portion of opacity information simultaneously identifying each~~ region representation being
assigned one or more of three predetermined values, each predetermined value distinctly
identifying whether a corresponding sub-region is an opaque [[regions]] region, a transparent
~~regions and region or a transparent region represented by the node;~~

identifying nodes of the expression tree, for which compositing
information is required, depending on the ~~portion of opacity information~~ region representation
associated with the node; and

optimizing the expression tree by performing a second traversal of the
expression tree to determine compositing information for each node of the expression tree
identified in the first traversal, wherein the compositing information is determined for a node
using the ~~portion of opacity information~~ region representation determined for the node, and
wherein the compositing information indicates at least invisible regions, load regions and visible
regions represented by the node.

Claim 98 (previously presented): The method according to claim 97, wherein
the compositing information is represented by a first hierarchical structure.

Claim 99 (currently amended): The method according to claim 98, wherein the
opacity information region representation comprises a second hierarchical structure representing
an opacity of a region associated with a node.

Claim 100 (currently amended): The method according to claim 98, wherein the opacity ~~information~~ region representation is ~~represented by~~ a bounding box representing an opacity of a region associated with a node.

Claim 101 (currently amended): The method according to claim 98, wherein the first hierarchical structure is dependent on the opacity ~~information~~ region representation.

Claim 102 (previously presented): The method according to claim 97, wherein the first traversal is a bottom-up traversal.

Claim 103 (currently amended): The method according to claim 99, wherein opacity ~~information~~ region representation of a child node is at least propagated to a parent node associated with the child node.

Claim 104 (currently amended): The method according to claim 103, wherein opacity ~~information~~ region representation of the parent node is determined by merging at least two second hierarchical structures.

Claim 105 (currently amended): The method according to claim 103, wherein opacity ~~information~~ region representation of the parent node is determined by merging at least one second hierarchical structure and a bounding box.

Claim 106 (previously presented): The method according to claim 97, wherein the second traversal is a top-down traversal.

Claim 107 (previously presented): The method according to claim 106, wherein a first hierarchical structure of a parent node is at least propagated to a child node associated with the parent node.

Claim 108 (currently amended): An apparatus for optimizing an expression tree, the expression tree representing a compositing expression for compositing an image and comprising a plurality of nodes, each node of the expression tree representing ~~at least one region~~ of an object of the image or an operation for combining sub-expressions of the compositing expression, said apparatus comprising:

b, means for determining ~~a region representation~~ an opacity quadtree for at least one node of the expression tree, each node of the ~~region representation simultaneously~~ identifying each opacity quadtree being assigned one or more of three predetermined values, each predetermined value distinctly identifying whether a corresponding sub-region is an opaque region, a transparent region [[and]] or a partially transparent region ~~represented by the node~~; and

means for optimizing the expression tree by determining compositing information for at least one node of the expression tree, the compositing information for a node being determined using the ~~region representation~~ opacity quadtree determined for the node, wherein the compositing information represents at least one visible region to be composited for an object associated with the node.

Claim 109 (previously presented): The apparatus according to claim 108, wherein the compositing information is represented by a first hierarchical structure.

Claim 110 (currently amended): The apparatus according to claim 109, further comprising means for identifying nodes of the expression tree, for which a first hierarchical structural is required, depending on a ~~region representation~~ opacity quadtree associated with the node.

Claims 111 and 112 (canceled)

Claim 113 (currently amended): An apparatus optimizing an expression tree, the expression tree representing a compositing expression for compositing an image and comprising a plurality of nodes, each node of the expression tree representing ~~at least one region~~ of an object of the image or an operation for combining sub-expressions of the compositing expression, said apparatus comprising:

pb,
means for ~~performing a first traversal of the tree to determine at least a portion of~~ determining an opacity information region representation for at least one node of the expression tree, ~~each node of the portion of opacity information simultaneously identifying each region representation being assigned one of three predetermined values, each predetermined value distinctly identifying whether a corresponding sub-region is an opaque region, a transparent region [[and]] or a partially transparent region represented by the node; and~~

means for optimizing the expression tree by determining a hierarchical structure for at least one node of the expression tree, wherein the hierarchical structure is determined for a node using the ~~portion of opacity information~~ region representation determined for the node, and wherein the hierarchical structure represents at least invisible regions, load regions and visible regions to be composited, for an object associated with the node..

Claim 114 (currently amended): An apparatus optimizing an expression tree, the expression tree representing a compositing expression for compositing an image and comprising a plurality of nodes, each node of the expression tree representing ~~at least one region~~ of an object of the image or an operation for combining sub-expressions of the compositing expression, said apparatus comprising:

means for performing a first traversal of the expression tree to determine ~~at least a portion of an~~ opacity information region representation for at least one node of the expression tree, the opacity ~~information simultaneously identifying each region~~ representation being assigned one or more of three predetermined values, each predetermined value distinctly identifying whether a corresponding sub-region is an opaque region, a transparent region [[and]] or a partially transparent region represented by the node;

b1
means for identifying nodes of the expression tree, for which compositing information is required, depending on the opacity information region representation associated with the node; and

means for optimizing the expression tree by performing a second traversal of the expression tree to determine compositing information for each node of the expression tree identified in the first traversal, wherein the compositing information is determined for a node using the opacity information region representation determined for the node, and wherein the compositing information represents at least invisible regions, load regions and visible regions to be composited for an object associated with the node.

Claim 115 (currently amended): A computer program for a computer comprising software code portions for performing a method for optimizing an expression tree, the expression tree representing a compositing expression for compositing an image and

comprising a plurality of nodes, each node of the expression tree representing ~~at least one region~~ of an object of the image or an operation for combining sub-expressions of the compositing expression, said program comprising:

code for determining ~~a region representation~~ an opacity quadtree for at least one node of the expression tree, ~~each node of the region representation simultaneously identifying each~~ opacity quadtree being assigned one or more of three predetermined values, each predetermined value distinctly identifying whether a corresponding sub-region is an opaque region, a transparent region ~~[[and]]~~ or a partially transparent region represented by the node; and

code for optimizing the expression tree by determining compositing information for at least one node of the expression tree, the compositing information for a ~~[[note]]~~ node being determined using the ~~region representation~~ opacity quadtree determined for the node, wherein the compositing information represents at least one visible region to be composited for an object associated with the node.

Claim 116 (currently amended): A computer readable medium storing a computer program, wherein said computer program comprises software code portions for performing a method for optimizing an expression tree, the expression tree representing a compositing expression for compositing an image and comprising a plurality of nodes, each node of the expression tree representing ~~at least one region~~ of an object of the image or an operation for combining sub-expressions of the compositing expression, said program comprising:

code for performing a first traversal of the expression tree to determine ~~at least a portion of an~~ opacity information region representation for at least one node of the expression tree, the ~~portion of opacity information simultaneously identifying each~~ region representation being assigned one or more of three predetermined values, each predetermined

value distinctly identifying whether a corresponding sub-region is an opaque region, a transparent region [[and]] or a partially transparent region represented by the node; [[and]]

code for identifying nodes of the expression tree for which compositing information is required, depending on the opacity region representation associated with the node;
and

B1 code for optimizing the expression tree by determining a hierarchical structure for at least one node of the expression tree, wherein the hierarchical structure for a [[note]] node is determined using the ~~portion of opacity information~~ region representation determined for the node, and wherein the hierarchical structure represents at least invisible regions, load regions and visible regions to be composited for an object associated with the node.
